

SOLAR POWER MICRO-INVERTER



EFS WVD-260W PV micro inverter User Manual

System function

➤ Power line carrier-current communication (Used in EFS WVC series)

By using electric power as a carrier of AC alternating current, can modulate high-frequency and carrier frequency (60KHz) in AC wire transmission and can achieve the communication/newsletter between inverters or between inverter and computer. And it can transfer the power data and the brightness date of the sunshine in the real-time. Also monitor all functions of inverter.

1. Carrier frequency: 60KHz (Frequency customizable)
2. Interface way: TTL level serial interface
3. Carrier rate: 300BPS
4. Serial rate: 9600BPS (Can customize according to customer's request)
5. Modulation mode: FSK+DSSS
6. Newsletter distance: 2Km

➤ 6-grade power search

In overcast weather, the solar battery's output current is extremely tiny, then inverter will automatic open 6-grade power search function.

1. The program can automatically open power adjustment for 6 times.
2. The current direction can adjust from the maximum to the minimum.
3. In automatic adjustment process, we will see the LOW light flashing. And the power will keep as a starting point, from 0 to the maximum output power, and it will restart at most for 6 times, then locked in the maximum power, the ST lamp long bright.
4. It need 10 minutes for 6-grade power search.

➤ Wide voltage input(22-60VDC)

Achieve wide voltage input.

1. DC voltage input: 22-60VDC
2. Second level power variable voltage conversion

➤ High-frequency two-way and one-way grid function

1. High frequency direct modulation, AC half wave synthesis
2. Two-way grid means: Load consume directly. And can reverse AC current transmission.

➤ Kinds of frequency output function.

1. It can apply to 50Hz and 60Hz frequency of AC.
2. Frequency range: 48Hz ~ 63Hz

➤ directly connected to the solar panels (do not need to connect the battery)

Using precise Dynamic differential pressure type MPPT function, APL functions, the inverter automatically adjust the solar panels of maximum output power, simply connect the solar panel to the grid inverters. Do not need to connect the battery.

1. Differential pressure type MPPT: 0.1 V accuracy
2. Power lock: 10W (AC output)

➤ AC 0 angle with high precision auto-detection

AC phase angle of 0 through isolation amplifier then input to the MCU for high-precision detection and analysis. The phase shift rate is less than 1%, thus achieve high-precision with phase modulation AC output together.

1. AC phase shift: < 1%

2. Over-zero protection: 0.2 VAC

3. AC switching: 50Hz / 60Hz

➤ Synchronous High-frequency Modulation

In the process of the grid, usually adapt the same phase angle in parallel. (ie, When the two-phase alternating current total is equal to 0. Use switch to combination the two AC fusion) and the product is rectified AC half-frequency AC to 100Hz first, then the machine use the high frequency current in the circuit and semi-100Hz frequency alternating current generated combination, to achieve high-frequency modulation.

1. Modulation synthesis: half wave and full-bridge modulation synthesis (100Hz / 120Hz)
2. Synthetic way: MOSFET full-bridge
3. High frequency: 50KHz

➤ Pure Sine Wave Output

Use SPWM directly to make pure sine wave output.

1. Output waveform: Adopt complementary PWM to push-pull pure sine wave.
2. Generate means: enhancement-mode SPWM

➤ Automatic Sensing Function Solar Luminosity

Use the latest luminosity perception operation technology. The different illuminate angle and intensity of the solar panel will produce different current output. Use advanced CPU to operate the different intensity of illumination and the data can be directly displayed on the LCD. Then you can visually see the sense of the strength of the sun unit. Used more convenient.

1. Luminosity sampling point : power sampling point
2. High precision AD sampling: integral AD sampling method

➤ Power Automatically Locked (APL)

In different current fluctuations, we should use the MPPT function. When the MPPT function adjusted to the maximum power point, the product automatically powers locked in maximum power point, then made the output power more stable.

1. Power lock: The biggest sampling point of MPPT.

➤ Automatically Adapt To Different Load Power Factor

Adapt to any of the power load.

➤ Constant Current, Constant Power

This product is constant current, constant output power, without any overload, over-current phenomenon.

➤ Automatically Shut Down When The Power Grid Fault

When the city power system is in failure, the inverter will automatically turn off the output.

1. Current Limit Protection
2. Current limit

➤ Stack Multiple Machines

Multiple small power inverters in parallel can achieve large output power.

➤ High-Frequency High Conversion Rate

Adapt high frequency converter, the output more efficient.

➤ Maximum Power Point Tracking (MPPT)

Because the current intensity and the voltage changes at any time, if there is no power point tracking, there will be a lot of problems. In the past time, usually adopt a solar controller, but this product uses high-precision (MPPT) operation power, automatic and immediate adjust the solar panels output power at the maximum output point, then achieve a stable output purposes.

MPPT is for short of "Maximum Power Point Tracking". It means the controller can sense the voltage of the solar panels on time, and can track the highest voltage and current (VI).Then made the inverter discharge to power grid with the highest efficiency.

The peak voltage (Vpp) of the solar panels is about 38V when it in factory. And the environment temperature is 25 ° C. The reason of setting this temperature(interestingly, different from the subjective imagination, we ordinary people the conclusion may let us surprised) is that when the weather is very hot, solar panels' peak voltage will fall to about 36 V while in cold weather, the peak voltage can achieve 43 V.

Now we back to contrast the difference of MPPT solar energy grid inverter and traditional inverter. The traditional solar inverter is a bit like the manual gearbox. When the engine speed increase, while the gearbox gear don't increase at the same time, it will definitely affect the speed of the car. For traditional inverter speaking, the parameter output power is been set in factory. It likes a car have been fixed set on fixed 1 gears, no matter how powerfully you trample accelerator, the speed of a car is limited. While have the MPPT function it will be different, it is automatically. It will automatically adjust the gears according to the engine' speed, so it can make cars in the most gears in a reasonable efficiency standard operation. It means the MPPT controller can track the maximum power point of solar panels in real-time then express the biggest efficiency of solar panels. The higher the voltage, the more power

can be output through the MPPT. Thus improve the charging efficiency. Theoretically speaking, using MPPT, the efficiency can be increased by 50% compared with the traditional inverter. But due to environmental impact and various around energy loss, the ultimate efficiency can improve 20%-30% according to our actual testing.

➤ Stack using

In order to achieve higher power use requirements, this product can be stacked. Such as: 4 micro inverter of 260W stacking can achieve 1040W. And the number of the stacking is unlimited.

➤ DC input

Input voltage range: 22V to 60V

Solar Panel: Recommend using the power more than 30W and the standard voltage of 36V PV panels.

Recommend using multiple solar panels. Solar panel in series will result in high-input voltage which will exceed the working voltage range of the inverter.

➤ AC output

Voltage range of the inverter whose output is 220V AC.: 190V - 260V, 50HZ

Voltage range of the inverter whose output is 110V AC.: 90V - 160V, 60HZ

Parameter table

models	EFS WVD-260W-230V/50Hz/120V/60Hz
Recommend use solar panels	300Wpv
DC MAX input current	20A
AC MAX output power	260Watt
DC MAX Open-circuit input-voltage	100VDC
DC input voltage range	22~60VDC
MAX output power factor	0.99
DC input Reverse voltage protection	FUSE
AC output voltage range	(120V versions 90~160VAC) (230V versions 190~260VAC)
AC frequency range	48~63Hz
Output current total harmonic distortion	THDIAC <5%
AC Phase	<0.5%
Islanding protection	VAC; f AC
Output short circuit protection	Current-limiting
Show	LED mode power instruction voltage instruction AC frequency instruction over-voltage instruction
Communication way	60KHz modulation, power line carrier-current communication
Standby Power	<1W
Night Power	<1W
Ambient temperature range	-25 °C~60°C
Humidity	0~100%(Indoor Type Design)
Waterproof	IP65
Electromagnetic Compatibility	EN50081.part1 EN50082.part1
Power System Disturbance	EN61000-3-2 EN62109
Network test	DIN VDE 1026 UL1741
Certificate	CE

Packing and weight

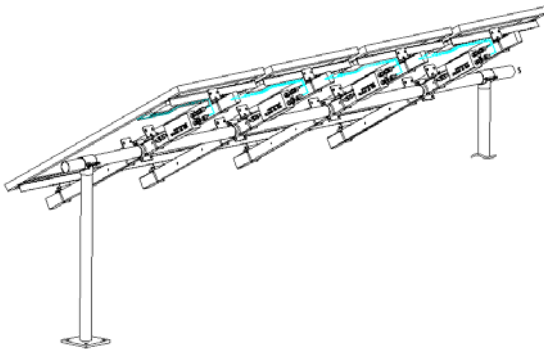
Net weight	0.66kg	
Gross weight	0.85kg	
Size (L x W x H)	190×78×52mm	
Package (L x W x H)	Inner box:31x12x8.5CM	Big box:54x33x51CM
Installation	Back of solar panel	

Operation Instruction

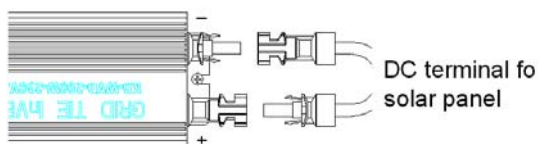
1. Use the 4*10mm screws to fix the inverter on the holder of the solar panel. Show below:



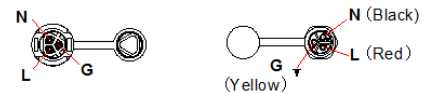
Use screws to fix the inverter on the holder of the solar panel



2. Connect the two DC terminal of the PV to the inverter, positive to positive, negative to negative. Show below:

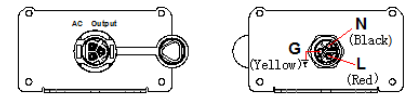


3. Connection of AC output, connect the AC wire to the AC waterproof plug. Show below:

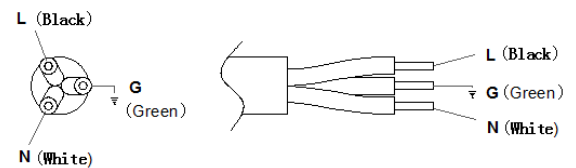


Front

Back

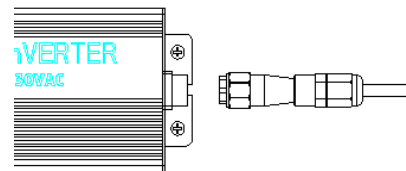


Connection of bafflw



AC Line

4. Connect the AC plug to the inverter's AC terminal. Show below:



LED display

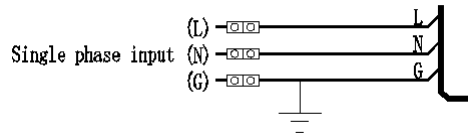
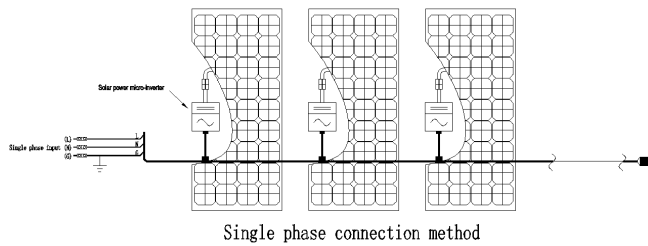
Finished all the connections, confirm the AC and DC connection is right.

The LED is red when the AC power is unconnected and the LED shows like below when the AC power is connected. The LED shows like below:

- A) Power failure display
LED in red:
 1. Power cut off
 2. Output failure
 3. Power grid fault
 4. DC low- voltage display(protection)
 5. DC over-voltage display(protection)
 6. Over temperature display(protection)
- B) Power adjust display
 1. LED in green, but flashing, it means power is in adjusting condition.
 2. LED in green and steady, it means the power is locked, and the inverter works.

Single-phase connection

Connection electrical diagram of the solar inverter used in single-phase power generation system, show below

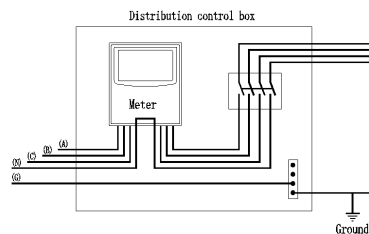
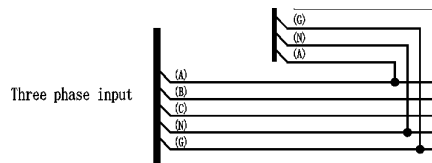
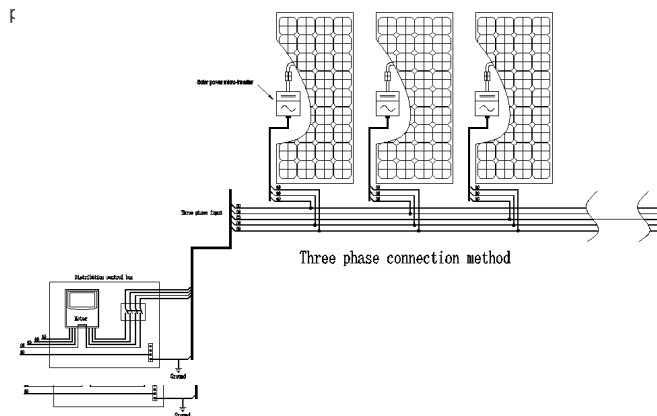


Notes:

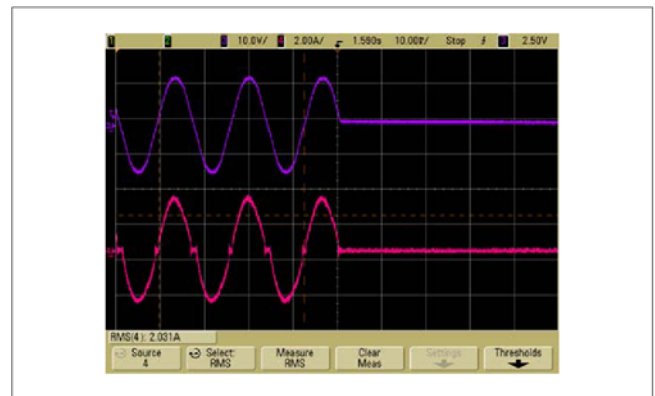
- Please connect the inverter following the operation instruction show above. If have any question please contact with relative persons.
- Non-professionals do not disassemble. Only qualified personnel may repair this product.
- Please install inverter in the low humidity and well-ventilated place to avoid the inverter over-heating, and clear around the inflammable and explosive materials.
- When using this product, avoid children touching, playing, to avoid electric shock.
- Connected solar panels, battery or wind generators DC input DC power supply cable.

Three-phase connection

Connection electrical diagram of the solar inverter used in three-phase



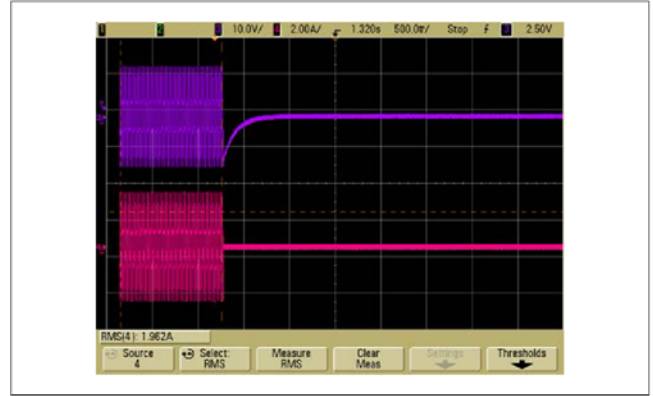
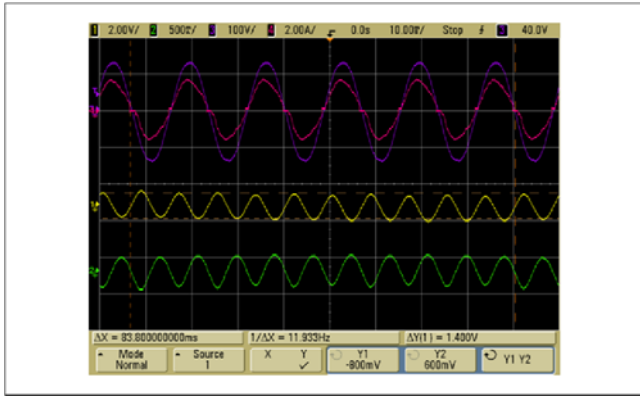
System islanding operation: When the AC voltage power grid in the zero value at the failure of the system shut down



Night mode: When the input voltage is less than the low-voltage threshold, the system shut down



PV panels voltage ripple and current ripple



System islanding operation: When the AC voltage peak power failure the system shut down

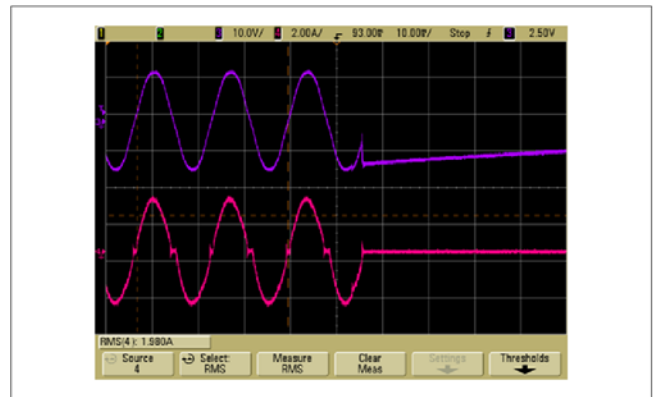
Accessories for product

1. One warranty card
2. One user manual
3. One certificate of quality

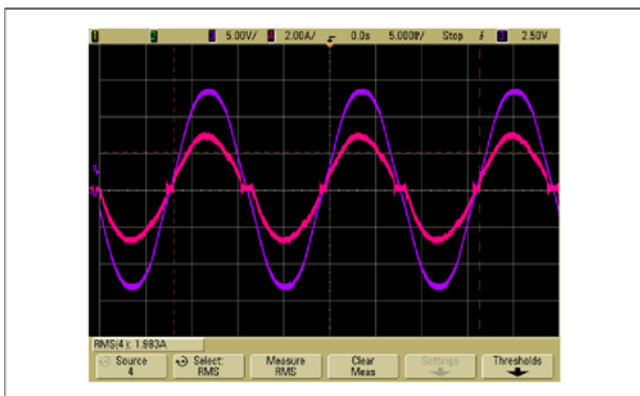
Laboratory test results and waveforms

The following figure shows the grid voltage, grid current, system transfer and island transportation MPP voltage waveform. In the following oscilloscope images, waveforms' color and have the following meanings:

- CH1 = yellow color is the solar micro-inverter input voltage
- CH2 = green color is the solar micro-inverter input current
- CH3 = purple color is the power grid voltage
- CH4 = magenta color is the power grid current



Grid voltage and grid current



System islanding operation: power failure, the system shut down